Effect of Some Cover Systems on Total and Early Season Yields of Pepper Under The Samsun Province Conditions of Turkey

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Abstract: This study was conducted to determine effectiveness of some cover systems on the early season yield and total yield of pepper in the Black-Sea region of Turkey between the years 2001–2003. As experiment materials, green pepper cultivar Çetinel 150 which has being grown in the region conventionally, black, yellow and transparent polyethylene covers as well as Agryl were used. Three planting dates, black mulch and low plastic tunnel treatments were combined in different ways and experiments were designed with total 10 treatments and four replications. Growing in open field conditions which was a producer practice was tested in the experiments as a comparison treatment. As a result of the study, maximum yields regarding early, medium, late seasons (9,150-30,470-6,470 tons/ha respectively) as well as maximum total yield (46,110 Tons/ha) were obtained from April 1 planting and Agryl cover combination whereas minimum yields regarding early, medium, late seasons (4,130-19,170-3,680 tons/ha respectively) as well as minimum total yield (26,980 tons/ha) were obtained from May 1 planting which was conventional farmer treatment or comparison treatment. April 1 planting and Agryl cover combination increased the total, early, medium and late season yields 1.70, 2.21, 1.58 and 1.75 fold more comparing to May 1 planting, respectively.
Key Words: Pepper, Cover systems, Total yield, Early season yield

Samsun İli Şartlarında Bazı Örtü Sistemlerinin Biberin Verim ve Erkenciliği Üzerine Etkisi

Özet: Bu araştırma Karadeniz bölgesinde bazı örtü sistemlerinin biberin verim ve erkenciliğine etkisini belirlemek üzere 2001-2003 yıllarında yürütülmüştür. Denemelerde materyal olarak Karadeniz Bölgesinde yetiştirilen Çetinel 150 sivri biber çeşidi, siyah, sarı ve saydam polietilen örtü ayrıca Agryl kullanılmıştır. Çalışmada 3 dikim zamanı, siyah malç ve alçak plastik tünel uygulamaları farklı şekilde kombine edilerek 10 konulu ve 4 tekerrürlü olarak denenmiştir. Açıkta yetiştiricilik deneme konuları arasında bir mukayese kriteri olarak yer almıştır. Elde edilen sonuçlara göre erkenci, orta mevsim ve geççi verim yönünden en yüksek verimler 01 Nisan dikimi+Agryl Örtü uygulamasından elde edilirken en düşük verimler üretici uygulaması olan 1 Mayıs dikimlerinden elde edilmiştir. 01 Nisan dikimi+Agryl Örtü uygulaması 1 Mayıs dikimi uygulamasına göre toplam verimi 1.70 kat, erkenci verimi 2.21 kat, orta mevsim verimini 1.58 kat ve geççi verimi de 1.75 kat artırmıştır 1.58 kat ve geççi verimi de 1.75 kat artırmıştır.
Anahtar Kelimeler: Biber, Örtü sistemleri, Verim, Erkencilik

1. Introduction

Turkey's total pepper production is 1.200.000 tons. The most important provinces regarding pepper production in Turkey are Samsun 185.100 tons (15.4%), Bursa 180.900 tons (15.1%), Antalya 110.225 tons (9.2%) and İzmir 100.750 tons (8.4%) (Anonymous, 2009). That is Samsun is in the first rank in respect to pepper production in Turkey. Greenhouse cultivation has been developing fast in especially Samsun and Ordu provinces as well as Amasya, Tokat, Giresun, Kastamonu, Sinop, Trabzon, Zonguldak provinces in the Black-Sea region of Turkey. Pepper production has been intensifying during the summer period so pepper prices have been decreasing to a great extent comparing the winter period. That is to say early and late season pepper growing is very important for the pepper similar to other summer vegetables. It was established by the previous investigations in the Black-Sea region that polyethylene mulch treatments had positive effects on the total and early season yields of pepper. On the other hand it was determined by the investigations

conducted in Turkey and foreign countries that Agryl treatment had the positive effects on the total and early season yields of vegetables (Gül and Tüzel, 1990), (Faouzi et al., 1993), (Tekin and Akıllı, 1995).

Gül ve Tüzel (1990) declared that Agryl P 17 treatment increased the yield from 2.15 kg to 4.93 kg per parcel for the carrot and from 3.0 kg to 3.9 kg for the lettuce. In addition Agryl treatments increased the average root weight and root length for the carrot and average core weight for the lettuce according to their investigations.

Pakyürek at al. (1991) established that black polyethylene mulch treatment increased early season and total yields of the pepper from 18.3 tons to 19.2 tons per hectare and from 79.0 tons to 84.7 tons, respectively.

Faouzi at al. (1993) conducted a research on the effects of Agryl treatment on the winter squash. According to results first virus symptoms were observed in the thirty days after the planting in the control plots whereas first virus symptoms were observed in the thirty days after the removing of the Agryl cover from the plots on which Agryl was applied. After the harvest infection rate in the plots on which Agryl was applied was lower at the rate of 50% than the control plots. First harvest date in the plots on which Agryl was applied was 8 days earlier than the control plots. Early season and total yields per each plant in the plots on which Agryl was applied were 640.2 g and 2219 g whereas 539.6 g and 1190 g in the control plots, respectively.

Tekin and Akıllı (1995) investigated the effects of different cover materials on the yield and quality of the pickled cucumber grown in the field conditions and they used low plastic tunnel and Agryl P 17 as cover material. As a result of the experiment Agryl P 17 gave the best results in respect to total fruit yield and number. Total fruit yield was 334.06 g in the control plots; 396.68 g in the low plastic tunnel plots and 471.40 g in the Agryl P 17 plots.

Türkmen at al. (1995) searched the effects of mulch on green pepper and found that its effect was important. Total and early season yields on mulched plots were 396.2 g/plant, 134.8 g/plant and were 269.0 g/plant, 127.9 g/plant on non-mulched plots, respectively. The effects of mulch on stuff pepper and it was determined that its effect was important. Total and early season yields on mulched plots were 454.9 g/plant, 187.0 g/plant and were 241.7 g/plant, 105.8 g/plant on non-mulched plots, respectively.

Apaydın et al.(1996) declared that black mulch and April 1 planting date as well as black mulch and April 15 planting date combinations were the most profitable two treatments in tomato according to their research conducted in the Black-Sea Region of Turkey during the years 1994 and 1995. But they were established that because end of the March and beginning of the April were cold and freezing as well as April 1 planting date was less profitable comparing to April 15 planting date in the Black-Sea Region of Turkey, black mulch + April 15 planting date was advisable for the region farmers and this treatment increased the total and early season yields 1.4 and 22.6 fold more comparing to conventional farmer growing.

Kaplan (1998) declared that vegetable growing in different planting dates under the low plastic tunnel was profitable comparing to open field conditions. In addition referencing to Yazgen (1992) he mentioned that the temperature under the plastic tunnel comparing to open conditions was 5^0C and 15^0C higher in cloudy days and in sunny days, respectively.

This investigation was aimed to determine the effectiveness of polyethylene mulch, Agryl and low plastic tunnel treatments on total and early yields of the pepper which has economic importance in the Black-Sea region of Turkey.

2. Material and Method

Agryl P 17 of which thickness was 0.05 mm and light permeability was 74.4% as well as black, yellow and transparent polyethylene covers of which thickness was 0.05 mm and the pepper cultivar Çetinel 150 was used as material in the experiments. Average climatic values during the period in which cover materials were used have been presented in Annex 1. Three planting dates; black, yellow and transparent polyethylene mulch; Agryl P 17 and low plastic tunnel treatments were combined in different ways and the experiments were designed with 10 treatments and with 4 replications. The

treatments applied in the experiments were as follow:

1-April 1 planting + Agryl tunnel

2-April 1 planting + transparent polyethylene tunnel

3-April 1 planting + yellow polyethylene tunnel

4-April 1 planting + Agryl cover

5-April 15 planting + Agryl tunnel

6-April 15 planting + transparent polyethylene tunnel

7-April 15 planting + yellow polyethylene tunnel

8-April 15 planting + Agryl cover

9- April 15 planting + black polyethylene mulch

10-May 1 planting (conventional farmer treatment)

May 1 planting was used as comparison criteria because it was a conventional farmer treatment. Experiments were established in accordance with randomized complete block design. Plant spacing was 50x75x100 cm. There were two rows in each parcel and 10 plants in each rows. Mulch, Agryl and low plastic tunnels were established in the experiment area in 15 days before the planting and removed in May 1. Height of the low plastic tunnels was 120 cm and tunnel covers were punched so that there were 50 pores per square meter and pore diameter was 1 cm. Harvests were done once a week and yield values were recorded. Obtained results were evaluated by Duncan test statistically.

3. Results and Discussion

Seeds were sown at the dates of March 1, March 15 and April 1 and after the sowings seedlings were ready to plant in one month. According to treatments harvests were begun during the end of June- middle of July and were continued up to early period of November. Obtained total yield values varied between 26,980-46,110 tons/ha (Table 1). Generally the yields obtained from April 1 plantings were higher than April 15 plantings and the yields obtained from April 15 plantings were higher than May 1 planting which was conventional farmer treatment as well as comparing criterion in this research. Maximum yield (46,110 tons/ha) was obtained from April 1+Agryl cover treatment; minimum yield (26,980 tons/ha) was obtained from May 1 treatment. End of June-July period has been accepted as early season yield period; August-September months as middle season yield and October as late season yield, respectively. April 1 plantings increased the total, early season and late season yields at the rate of 15 %, 13% and 19% respectively comparing to April 15 plantings. Maximum values (9,150-30,470-6,470 tons/ha) were obtained from April 1 planting +Agryl cover combination in respect to early season, middle season and late season yields; minimum yields (4,130-19,170-3,680 Tons/ha) was obtained from May 1 planting respectively. That is to say April 1 planting +Agryl cover treatment increased the early season, medium season and late season yields 2.21, 1.58 and 1.75 fold more than May 1 planting, respectively (Table 2). The data obtained from this study is similar to the data obtained from Faouzi at al (1993).

So April 1 planting and Agryl cover combination is advisable for the region producers. The data about positive effects of Agryl treatment on the total yield and was obtained from this research is in accordance with the data obtained by Tekin and Akıllı (1995), Gül and Tüzel (1990), Faouzi et all (1993).

4. Conclusion

April 1 planting and Agryl cover combination has increased the total, early, medium and late season yields 1.70, 2.21, 1.58 and 1.75 fold more, respectively comparing to conventional farmer treatment May 1 planting in the open field conditions for pepper growing in the Black Sea region of Turkey. So April 1 planting and Agryl cover combination is advisable for the region producers.

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Table 1. First and Last Harvest Periods and Average Total Yield Values in the Pepper During the Years 2001-2003

Treatments (Planting Dates+ Cover Systems)	**The Days between the Planting and the First Harvest (First Harvest Period)**	**The Days between the First Harvest and the Last Harvest (Last Harvest Period)**	**Total Yield (Tons/ha)***
1-April 1+Agryl Tunnel	88 (End of June)	129 (beginning of November)	39,100 bd
2- April 1+Transparent Tunnel	94 (beginning of July)	123 (beginning of November)	41,390 b
3- April 1+Yellow Tunnel	94 (beginning of July)	123 (beginning of November)	39,890 bc
4-April 1+ Agryl Cover	88 (End of June)	129 (beginning of November)	**46,110 a**
5- April 15+Agryl Tunnel	73 (End of June)	129 (beginning of November)	37,740 cd
6- April 15+Transparent Tunnel	79 (beginning of July)	123 (beginning of November)	34,390 ef
7- April 15+Yellow Tunnel	79 (beginning of July)	123 (beginning of November)	37,920 cd
8- April 15+ Agryl Cover	79 (beginning of July)	123 (beginning of November)	37,040 de
9-April 15 + Black Polyethylene Mulch	79 (beginning of July)	123 (beginning of November)	33,670 f
10-May 1 (Farmer Practice)	71 (middle of July)	115 (beginning of November)	26,980 g C.V : 7.93

P<0.05 Differences among the averages marked by same letter aren't important in respect to statistical analysis

Table 2. Average Early Season, Middle Season and Late Season Yields in the Pepper Between the Years 2001 and 2003

Treatments (Planting Dates+ Cover Systems)	**Early Season Yield (Tons/ha)***	**Middle Season Yield (Tons/ha)***	**Late Season Yield (Tons/ha)***
1-April 1+Agryl Tunnel	8,560 ab	24,670 cd	5,860 b
2- April 1+Transparent Tunnel	7,840 bc	27,850 b	5,700 bc
3- April 1+Yellow Tunnel	7,490 cd	26,900 b	5,490 cd
4-April 1+ Agryl Cover	**9,150 a**	**30,470 a**	**6,470 a**
5- April 15+Agryl Tunnel	7,950 bc	24,520 cd	5,270 de
6- April 15+Transparent Tunnel	6,890 d	22,920 d	4,570 gh
7- April 15+Yellow Tunnel	7,050 d	26,030 bc	4,830 fg
8- April 15+ Agryl Cover	8,040 bc	23,970 cd	5,030 ef
9-April 15 + Black Polyethylene Mulch	5,940 e	23,880 cd	4,410 h
10-May 1 (Farmer Practice)	4,130 f	19,170 e	3,680 ı
	CV:11.15 *P<0.05	CV:9.37 *P<0.05	CV:7.30 *P<0.05

*****P<0.05 Differences among the averages marked by same letter aren't important in respect to statistical analysis